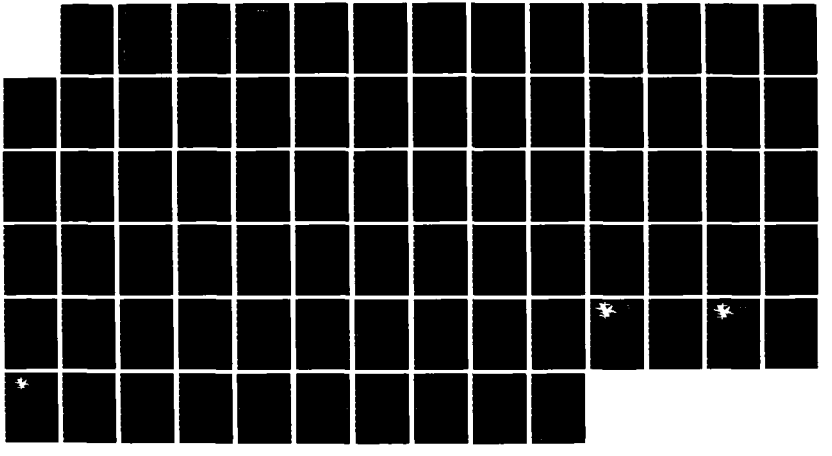
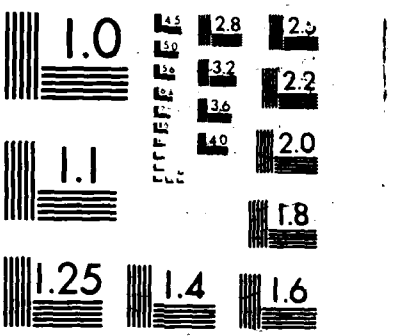
AD-A176 320 MEASURING THE REGIONAL ECONOMIC SIGNIFICANCE OF AIRPORTS(U) FEDERAL AVIATION ADMINISTRATION WASHINGTON DC OFFICE OF AIRPO.. S E BUTLER ET AL. OCT 86 1/1

UNCLASSIFIED DOT/FAA/PP/87-1 F/G 5/3 NL




1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.8
3.2
3.6
4.0

U.S. Department
of Transportation
**Federal Aviation
Administration**

Measuring the Regional Economic Significance of Airports

Office of Airport Planning and Programming
Washington, D.C. 20591

DOT/FAA/PP/87-1 October 1986

NOTICE

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its content or use thereof.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT/FAA/PP/87-1	AD-A176 320	

4. Title and Subtitle	5. Report Date
Measuring the Regional Economic Significance of Airports	October 1986
	6. Performing Organization Code
	8. Performing Organization Report No.
7. Author(s)	
Stewart E. Butler and Laurence J. Kiernan	
9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
U.S. Department of Transportation Research and Special Programs Administration Transportation Systems Center Cambridge, Massachusetts 02142	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	FINAL REPORT
U.S. Department of Transportation Federal Aviation Administration Office of Airport Planning and Programming Washington, DC 20591	14. Sponsoring Agency Code APP-400

15. Supplementary Notes

16. Abstract

This report provides advice on how to measure the importance of an airport to the economy of the surrounding area. It defines various measures of economic significance, describes the circumstances in which they are applicable, and provides guidelines for their initial approximation and subsequent computation.

The main areas covered are transportation benefits and economic impact. The analytical techniques described in this report can be used to estimate the positive economic effects of existing airports and the additional effects of increased aeronautical activity.

17. Key Words	18. Distribution Statement
Airport Economic Impact Transportation Benefits	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED		

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

MEASURING THE REGIONAL ECONOMIC SIGNIFICANCE OF AIRPORTS

Stewart E. Butler
Economic Analysis Division
Transportation Systems Center

Laurence J. Kiernan
National Planning Division
Federal Aviation Administration

October 1986

Contents

List of Tables

List of Figures

FOREWORD:

This report provides advice on how to measure the importance of an airport to the economy of the surrounding area. It defines various measures of economic significance, describes the circumstances in which they are applicable, and provides guidelines for their initial approximation and subsequent computation.

CHAPTER 1

INTRODUCTION

1.1 Purpose

The United States has the world's most extensive airport system. The system is essential to national transportation, and there is a large Federal investment in it. However, most public airports are owned and operated by units of local government.

Public airports must compete for funds with other governmental activities. They are scrutinized during budget preparation and may be the subject of public debate, particularly if major improvements or new construction are anticipated. They may even be the target of proposed restrictions aimed at limiting aircraft noise levels. In such instances, the future of an airport is determined primarily through the local political process.

It is important that the public and their representatives appreciate the economic significance of airports if they are to continue to support them. This report is designed to assist analyses of the economic importance of airports. It is not intended for use in financial feasibility studies or cost/benefit analyses. Rather, it provides basic guidance on how to measure the value of an airport to the area that it serves.

The report is directed to a wide audience with varying levels of sophistication in the field of economics. One objective is to encourage a standard approach to the measurement of the economic significance of airports. The report includes a uniform set of definitions, illustrations of the most useful analytical techniques, and descriptions of the conditions under which they are most appropriately applied. General

methodologies are emphasized rather than specific instructions. The procedures described in the report can be used to evaluate the economic significance of an existing or proposed airport or to study the consequences of increased activity at an airport.

1.2 Available Measures

The two main indicators that may be measured and cited as evidence of an airport's importance are its economic impacts and its transportation benefits. Economic impacts are the regional economic activities, employment, and payrolls that can be attributed, directly and indirectly, to the operation of a local airport. They describe the importance of aviation as an industry. Benefits are the services that a local airport makes available to the surrounding area. The two services emphasized in this report are time saved and cost avoided by travelers, but benefits also include other advantages, such as improved transportation safety and comfort. Benefits are a measure of the improved transportation that the airport provides, and thus reflect the primary motive of a community in operating a public airport.

Profit, or the difference between income and costs, is a valid measure of the viability of a private business. However, public airports are generally operated as public utilities, with provision of service rather than profit as the primary motive. Thus profit is not particularly relevant to the regional economic significance of an airport.

1.3 Applications

Information about the economic significance of airports has a wide variety of uses. It is an important element in airport master plans and system plans, because it helps to describe the basis for and consequences of the development of airports and the public involvement in them. The public is more likely

to support airports when they are aware of the substantial positive effects on the surrounding area. Economic impact and benefit data can be useful in evaluating the effects of airport use restrictions or curfews. Benefit data can be combined with income projections to help determine the viability of airport development proposals.

Analysts should consider the intended application of their work and its probable audience and design their analysis accordingly. Preliminary calculations derived from rules of thumb provide "ball-park" measures of an airport's significance and are appropriate only when quick-response information is required and precision is not essential. More detailed analytical techniques, which require more time and money to perform, are appropriate when a more precise estimate is needed. Detailed analyses may be used to support major investment decisions or as input into debates of a technical nature. A balance should be maintained between the effort in preparing an analysis and the effort in disseminating the results.

The following sections provide guidance on both simple rules of thumb and more sophisticated analytical techniques. Chapter 2 presents a methodology for the development of measures of transportation benefit. Chapter 3 offers suggestions for estimating economic impacts by means of (a) some statistical rules of thumb and (b) a comprehensive economic assessment. A brief summary is presented in Chapter 4.

CHAPTER 2

BENEFITS

2.1 Categories of Public Benefits

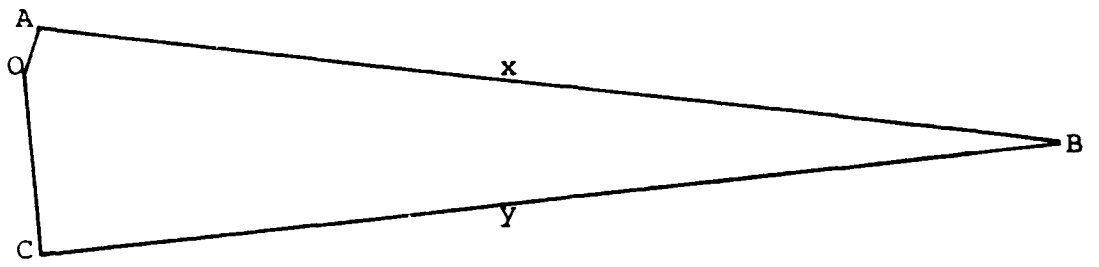
Benefits are the services that a community hopes to obtain by developing and maintaining an airport. They differ from economic impact, which is described in Chapter 3. Airports provide a variety of public benefits to the surrounding service areas. The most substantial of these are the time saved and cost avoided by using air transportation. These transportation benefits can be expressed in dollars, using the technique described in this chapter. Other benefits include the high levels of safety, comfort and convenience of aviation, the access that an airport provides to the national airport system, and enhancements to community well-being. These benefits cannot be expressed in dollars, but they can be explained and demonstrated by examples. In the case of reliever airports in metropolitan areas, a reduction in delays at airline airports can be cited and quantified.

2.2 Transportation Benefit

The primary benefits of an airport are usually the time saved and cost avoided by travelers who use it over the next best alternative. The following procedure measures the value of time saved and cost avoided by travelers as a result of an airport located at point A (see Figure 2-1). The nearest alternative airport is located at C, a farther distance from the point O where the trip originates. Individuals want to travel from O to B. The time saved by using airport A is the difference between the time for the O-C-B trip and the time for the more direct O-A-B trip. The benefit is the time saved per trip times the number of passenger trips, all multiplied

by the value of the passengers' time. There is also a benefit as a result of reduced ground travel costs, since airport A is closer to the origin of trips than airport C. There could be additional benefits if the flight distance x were shorter than the alternative flight distance y. In the examples below, it is assumed for the sake of simplicity that the flight distances are equal.

FIGURE 2-1
TRANSPORTATION BENEFIT OF AN AIRPORT



The variables that must be considered in the analysis are listed in Table 2-1. Most of them do not have to be determined for each analysis; typical values can be used instead. The critical variables that must be determined for each individual analysis are the number of based aircraft, the number of passengers in commercial air service, and the access distances to the airports at A and C. The total benefit is the sum of the time saving and travel cost reduction. The equations are shown separately and in the combined format. A more detailed analysis that considers the cost of aircraft flight time may be warranted if the distance x is substantially different from the distance y (See reference 6).

Time Saved

Annual Passengers = FGN + Y
O-C-B time = b/P + y/S
O-A-B time = d/P + x/S
Annual Benefit = E(FGN + Y)(b/P + y/S - x/S -d/P)

TABLE 2-1

TRANSPORTATION BENEFIT VARIABLES

Symbol	Variables	Typical Value (Use actual data when available.)
G	Itinerant operations per based aircraft per year (1)	300
N	Number of based aircraft at airport A	varies
d	Ground access distance to airport A (miles)	varies
E	Passenger time value ($/hour) (2)	25
F	Number of passengers per trip per general aviation aircraft (3)	2.5
P	Car speed (m.p.h.)	45
Q	Car costs, including amortization ($/mile) (4)	0.24
b	Ground access distance to alternative airport C (miles)	varies
Y	Annual passengers in commercial service	varies

Three additional variables are needed when use of the alternative airport substantially changes flight distance, i.e. $x \neq y$

x	Direct flight distance from origin airport A to destination airport B	varies
y	Alternative airport C to destination airport B flight distance	varies
S	General aviation or regional airline aircraft speed (m.p.h.)	varies

(1) An operation is either a landing or a takeoff. Aircraft based at airports with air traffic control towers averaged 302 itinerant operations in 1985.

(2) There is no source of precise data on passenger time. The FAA uses $25 per hour for estimating the value of aircraft owners' and pilots' time for internal reporting

TABLE 2-1 (cont.)

purposes. The Aircraft Owners and Pilots Association (AOPA) reports that the average annual income of its 260,000 members is $53,200, which equates to $25.58 per hour. The FAA used $22.30 per hour as an estimate of the value of airline passenger time in 1984 for computing the cost of air traffic delays.

(3) The average number of passengers per trip varies with aircraft type and is 1.5 for single engine piston aircraft with 3 seats or less, 2.3 for single engine piston aircraft with 4 seats or more, and 3.1 for multi-engine piston aircraft. See Reference (9).

(4) The American Automobile Association reports that a medium-sized automobile driven 15,000 miles a year costs $0.243 per mile to operate in 1985.

Reduced Ground Travel Cost

Annual Ground Trips = GN + Y[1]
O-C-B trip costs = Qb
O-A-B trip costs = Qd
Annual Benefit = (GN + Y)(Qb - Qd)

Total Benefit

Where x = y,
Total Annual Benefit = E(FGN + Y)(b/P - d/P) + (GN + Y)(Qb - Qd)
The transportation benefits from sample airports with various activity levels are illustrated in Table 2-2.

2.3 Rules of Thumb

The transportation benefits depend on several variables, particularly the additional ground travel involved in reaching an alternative airport. When that ground travel (b - d) is 20 miles, and the other variables are as shown in Table 2-1, the annual benefit from the airport is $9,773 per based aircraft plus $15.91 per passenger enplaned or deplaned in commercial service. A proportionate adjustment should be made to the benefits if the additional ground travel (b - d) is not equal to 20 miles. For instance, if b - d is equal to 10 miles, the benefits would be only half as great, or $4,886 per based aircraft and $7.95 per commercial passenger. If b - d is equal to 40 miles, the benefits would be twice as great, or $19,546 per based aircraft and $31.82 per passenger in commercial service. These figures can be used as a rule of thumb to estimate the transportation benefits of an airport.

---

[1] GN, the number of annual itinerant GA operations, is equal to the number of GA-related ground trips on the assumption that passengers making a GA trip together are acquainted and will share one automobile in travelling between the trip origin and the airport. Y, the number of annual commercial passengers, equals the number of ground trips related to commercial service on the assumption that each commercial passenger is travelling alone and requires a separate motor vehicle.

TABLE 2-2

APPROXIMATE BENEFITS FOR VARIOUS ACTIVITY LEVELS

Based Aircraft	Annual Commercial Passengers (1)	b - d: Reduction in Distance to Airport (2)	Value of Time Saved	Reduction in Travel Cost	Total Annual Transportation Benefit
10	0	20	$ 83,333	$ 14,400	$ 97,733
20	0	20	166,666	28,800	195,466
50	0	20	416,665	72,000	488,665
100	0	20	833,330	144,000	977,330
50	50,000	20	972,165	312,000	1,284,165
100	100,000	20	1,944,330	624,000	2,568,330
100	1,000,000	20	11,943,330	4,944,000	16,887,330

(1) Includes only origin and destination traffic; does not include through or transfer passengers.

(2) Highway mileage measured from the point where trips begin or end, typically the traveler's residence or place of business.

For example, an airport being studied has 25 based aircraft, and a regional airline served 6,000 passengers at the airport in the preceding year. The nearest alternative airport is 20 highway miles farther from the area served by the airport under study. The total annual transportation benefit from the airport is 25 aircraft times $9,773 per aircraft plus 6,000 passengers times $15.91 per passenger, or $339,785.

2.4 Effect of Increased Activity

An analysis can be used to determine the additional benefits that will result from increased activity at an airport. The increased activity may be the result of gradual growth in the demand for air transportation (passenger enplanements in the U.S. are forecast to increase at a rate of 4.5 percent per year), or it may occur rapidly as the result of an improvement to the airport or the introduction of new service. When the expected number of additional based aircraft and commercial passengers is known, the analytical technique or rule of thumb described in the preceding sections can be used to estimate the increased benefit. This information may be used to evaluate proposals to improve an airport or restrict airport growth.

2.5 Reduced Delays

A general aviation airport in a metropolitan area may be designated a reliever airport by the Federal Aviation Administration. In addition to providing access to the surrounding area, the airport relieves congestion at a busy airline airport by providing general aviation aircraft with an attractive alternative landing area. For instance, Teterboro Airport in New Jersey is a reliever for Newark Airport, serving over 400 aircraft that might otherwise land at Newark and add to congestion there.

The value of delay reduction resulting from a reliever airport can be computed by estimating the amount of traffic that would

be added to the air carrier airport if the reliever were not available and then using an airport capacity model to compute annual delays before and after this traffic is added. The average cost of an airline delay in 1984 was $1,647.00 per hour for airline operating expenses plus $22.30 per passenger hour. Aircraft delays increase exponentially as traffic is added to a congested airport, so the benefits of an effective reliever airport are usually quite large, and may be measured in millions of dollars.

2.6 Community Benefits

Some beneficial aspects of airports are significant but difficult to quantify. For example, airports contribute to the prompt diagnosis and treatment of disease. Blood and tissue samples are sent by air to medical facilities for analysis; isotopes, serum and antitoxin that cannot be stored locally are shipped by air whenever and wherever they are needed; organs for transplant operations are shipped by air; and patients often travel by air for dialysis and other treatment not available in their community.

A number of high schools, colleges and universities have aviation programs, and many offer degrees in these subjects. The programs are designed to train young people for careers in aviation. General aviation is a major training ground for the airline pilots of tomorrow. Such vocations may be conceived and nurtured at the local public airport.

Airports are vital civil defense facilities. They are extremely durable, and aviation is a key source of relief from natural disasters such as floods and earthquakes. They also support police, Civil Air Patrol, and National Guard activities and may be used by aircraft involved in pipeline patrol, detection of fuel and chemical spills, and forest fire detection and suppression.

While it is usually not possible to predict such uses or to express them in dollars, they can be illustrated by references to specific instances in which the local airport, or one in the general area, was used in an emergency. Anecdotal evidence and summaries of case studies can add a new dimension to discussions of airport benefits.

2.7 Stimulation of Business

Aviation is an essential form of business transportation, and it has helped to shape the size and structure of many major corporations. The presence of an airport and the type of services it provides are important considerations in the siting of business and industrial facilities. Large airports are magnets for warehousing, distribution centers, office parks, hotels, and other development. Smaller airports help to attract industry to small- and medium-sized communities, though they must work in concert with other factors such as the availability of a market, raw materials, labor, utilities, favorable treatment by local government, low taxes, community amenities, and sites that are economical to develop. As an important part of a rural area's transportation network, an airport is a factor in fostering business.

2.8 Access to the National Airport System

State and local agencies, working with the Federal government, have provided the United States with the world's most extensive and best equipped airport system. These airports accommodate about 40 percent of the commercial traffic in the world, and 60 percent of the general aviation traffic. It is through the local airport that an area gains access to this important national resource.

2.9 Recreation

50 percent of travel on commercial airlines and about [illegible] percent of general aviation trips are for recreation or [illegible]ation. The recreational uses of general aviation include [illegible]ilplaning, sky-diving, flying homebuilt aircraft, and local [illegible]ightseeing. These are an important source of recreation and entertainment and also provide revenues that help to defray the cost of developing and operating airports.

2.10 Commercial Activities

There is a variety of commercial activities involving aviation above and beyond the carriage of passengers. Air cargo accounts for several distinct businesses, including air freight and express delivery of small parcels. Many high-value goods are shipped by air, and even relatively low-value, heavy goods, such as automobile parts, are often shipped by air to minimize inventory and warehousing costs. General aviation aircraft are used for such commercial activities as agricultural applications (e.g., crop dusting), pipeline and utility line patrols, transportation of checks and records of commercial transactions, and on-demand air taxi and charter services.

CHAPTER 3

ECONOMIC IMPACTS

3.1 Definitions of Economic Impacts

Economic impacts measure the importance of aviation as an industry, in terms of the employment it provides and the goods and services it consumes. While the benefits described in Chapter 2 are the primary motive for airport development, economic impacts are beneficial results that help to generate and sustain public support for airports. The following definitions cover virtually every type of economic impact applicable to airports:

Direct impacts are consequences of economic activities carried out at the airport by airlines, airport management, fixed base operators, and other tenants with a direct involvement in aviation. Employing labor, purchasing locally-produced goods and services, and contracting for airport construction and capital improvements are examples of airport activities that generate direct impacts.

Some direct impacts, like airport employment, occur on site; others, like local production of goods and services for use at the airport, may occur off site. The distinguishing feature of a direct impact is that it is an immediate consequence of airport economic activity.

Strictly speaking, direct impacts should represent economic activities that would not have occurred in the absence of the airport. If it were determined that, without the airport, some on-site employees would be doing comparable work elsewhere in the region without displacing other workers, their employment should not be part of the airport's contribution to local economic activity. This would be significant in a region

with full or near full employment, where airport employment might draw workers away from other employers in the region, who then have to operate their businesses with less labor than they would otherwise employ. A similar problem is posed by the possibility that, in the absence of the airport, the region might have developed alternative modes of common carrier transportation more extensively and thus created employment opportunities for workers now employed at the airport.

As a practical matter, however, it will rarely be cost effective to develop a base-case scenario that depicts the economy of the region without the airport. The time and resources required for this exercise will seldom warrant the resulting improvement in the estimates of employment, payroll, and expenditure impacts.

Expenditures by airlines, fixed based operators, and tenants generate direct impacts, but only those that induce local business activity are relevant for a regional economic assessment. For this reason, it is important to distinguish between (a) the local value-added component of expenditures and (b) the regional import component. Thus, airline expenditures on fuel generate local fuel storage and distribution services and the importation of fuel into the region. In most parts of the country, only the former component is relevant for the analysis.

Similar considerations apply to the expenditures of gift shops, restaurants, and other airport businesses that purchase regional imports for resale. They may apply as well to airport construction and capital improvements.

Indirect impacts derive primarily from off-site economic activities that are attributable to the airport. These activities include services provided by travel agencies, hotels, restaurants, and retail establishments. These enterprises, like airport businesses, employ labor, purchase locally produced goods and services, and invest in capital expansion and improvements. Indirect impacts differ from direct impacts in that they originate

entirely off site. The same caveats regarding regional imports apply.

Like direct impacts, indirect impacts should theoretically represent economic activities that would not have occurred in the absence of the airport. For this reason, it would be desirable to distinguish between tourists (and other visitors) who would not have travelled to the region if there were no airport and those who would have come anyway by some other form of transportation. Only the former are really relevant for the estimation of indirect impacts. Unfortunately, it is seldom feasible to make this distinction. As a result, the impacts of expenditures of tourists and other visitors arriving at the airport may be overstated, particularly for regions that are easily accessible by rail, bus, and automobile.

Induced impacts are the multiplier effects of the direct and indirect impacts. These are the increases in employment and incomes over and above the combined direct and indirect impacts, created by successive rounds of spending. For example, most of the take-home income earned by airport employees is spent locally. Some of this spending becomes income to local individuals who provide services to the airport employees. Some of the spending by airport employees goes to local businesses and becomes income to the business owners and their employees. Then part of these second-round incomes are also spent locally and thus become income to another set of individuals. As successive rounds of spending occur, additional income is created.

Although some of the induced impacts occur locally, some are felt outside the region because of regional import components of the goods and services purchased. It is important, therefore, that the specific multiplier factors selected for the analysis take regional imports into account. More economically self-sufficient regions have higher multipliers than do regions that are more dependent on regional imports, because more

of the spending and respending is done in the area. Similarly, two or more counties considered together as one economic region will have higher multipliers than will each individual county. Suggestions for selecting and applying multipliers are presented later in this chapter.

Total impacts are the sum of the direct, indirect, and induced impacts.

Widespread adoption of the above definitions would contribute to the comparability of different airport impact assessments. The following sections indicate how these definitions can be useful to analysts in suggesting the kinds of data that should be collected and the ways in which these data should be analyzed.

3.2 Preliminary Estimates

This section presents rules of thumb for developing rough estimates of an airport's economic impacts, comparable to the rules of thumb cited in Section 2.3 for estimating benefits. These rules of thumb provide rough, first-cut approximations and will tend to yield low estimates, because they do not capture the indirect impacts such as sales by travel agencies, restaurants, and hotels, or the direct impact of purchases by the airport and its tenants. More precise estimates may be obtained by using the methodology presented in Section 3.3.

Rules of thumb have been developed for three broad categories of airports:

1. Air carrier airports with more than four million commercial passengers a year

2. Air carrier airports with fewer than four million commercial passengers a year

3. General aviation airports

Air Carrier Airports with More than Four Million Commercial Passengers per Year

Step 1. Determine employment at the airport.

If total airport employment is known, the analyst may proceed to Step 2. If airport employment is not known, it can be estimated by the following rule:

> For every 10,000 annual commercial passengers, including through passengers, the airport has approximately 8.8 employees. The uncertainty associated with this statistically derived coefficient (See Appendix A) can be indicated by a plus-and-minus 20 percent interval, with lower and upper limits of 7.0 and 10.6, respectively. For example, an airport with 10 million commercial passengers a year would have approximately 8,800 employees, with the actual employment almost certainly falling in the interval of from 7,000 to 10,600.

Note that this estimate does not include any large aircraft manufacturing or maintenance activity that may account for substantial additional employment at certain airports. These are addressed in step 3.

Step 2. Convert airport employment into airport payrolls.

A review of airport impact studies indicates that annual airport payroll per employee at high activity air carrier airports is approximately $27,000 (in 1984 dollars). To continue the example started in Step 1, the airport's estimated payroll would then be 8,800 times $27,000, or $237,600,000. The lower and upper limits would be $189,000,000 and $286,200,000.

Step 3. Determine employment and payrolls at aviation-related businesses.

In some cases, an aviation manufacturing plant, aviation maintenance facility, or other type of aviation-related business is located on or near the airport site. If it is clear that such facilities would not have located in the region in the absence of the airport, their employment and payroll impacts should be included in the analysis. Because these impacts will not be captured by the rule of thumb in Step 1, employment and payroll data will have to be obtained directly from the facility operators.

Step 4. Calculate induced impacts of airport and aviation-related employment and payrolls.

As defined in Section 3.1, induced impacts are the multiplier effects of employment, payroll, and other direct (and indirect) consequences of airport activity. Unfortunately, there is no single multiplier factor that applies to every region. The induced impacts of direct (and indirect) impacts will be larger for regions that are relatively self sufficient economically and smaller for areas highly dependent on regional imports. Estimates of the multiplier for the total U.S. economy are typically about 1.0 for induced impacts. Thus 1.0 should be the upper limit for rule-of-thumb estimation and generally be applied to large metropolitan areas with relatively self-sufficient economies. For rural areas or areas with little manufacturing capability, and where purchases of goods and services have a high regional import component, a multiplier factor as low as 0.5 may be appropriate.

Applying a multiplier of 0.75 to the direct employment and payrolls in the example above yields induced employment and payrolls equal to 6,600 employees and $178,200,000. For employment, the lower and upper bounds are 5,250 and 7,950; for payrolls,

they are $141,750,000 and $214,650,000. Of course, induced impacts would be larger if direct impacts included the employment and payrolls of aviation-related activities.

Step 5. Calculate total economic impacts.

The total economic impacts would then be estimated as the sum of the direct and induced employment and payroll impacts. In the example above, 15,400 jobs and $415,800,000 in incomes would be attributed to the airport. The plus-and-minus 20 percent intervals would range from 12,250 to 18,550 jobs and from $330,750,000 to $500,850,000 in incomes.

These figures are "ball-park" estimates but may substantially understate an airport's economic impacts because:

1. Airport employment and payrolls (and those of aviation-related facilities) are the only direct impacts considered. Other expenditures by airlines, fixed base operators, and tenants are not included in the analysis.

2. No indirect impacts (derived from off-site economic activities) are considered, e.g., services provided by travel agencies, hotels, restaurants, and retail establishments for the benefit of airport users.

These factors should be added to the estimated total economic impacts whenever suitable data are available.

Air Carrier Airports with Fewer than Four Million Commercial Passengers per Year

The following steps are identical to those developed above, but they vary somewhat in their implementation.

Step 1. Determine employment at the airport.

Employment at a smaller, less active air carrier airport is likely to be easier to determine by a direct head count than at a high activity airport with a large number of tenants. But if airport employment must be estimated, the following rule can be used:

> For every 10,000 annual commercial passengers, including through passengers, the airport has 8.4 employees. (The statistical basis for this rule is explained in Appendix A.) Use of a plus-and-minus 20 percent interval to account for the inherent uncertainty of this estimate yields a lower limit of 6.7 and an upper limit of 10.1. If, for example, an airport has 1 million commercial passengers, estimated airport employment would be 840 with an interval range from 670 to 1,010.

Step 2. Convert airport employment into airport payrolls.

A review of reports on the economic impacts of airports indicates that the typical airport payroll per employee at relatively low activity airports is approximately $22,000 (in 1984 dollars). Thus the airport employment estimated at 840 in Step 1 would represent payrolls of $18,480,000. The lower and upper limits would be $14,740,000 and $22,220,000.

Step 3. Determine employment and payrolls at aviation-related businesses.

This step is implemented as outlined above for high activity airports.

Step 4. Calculate induced impacts of airport and aviation-related employment and payrolls.

This step should be carried out as described above for more active airports. The appropriate multiplier factor depends

on the degree of economic self sufficiency of the region, not on the level of airport activity. If the region is unusually dependent on regional imports, a multiplier factor of 0.5 might be selected. This would yield induced employment of 420 jobs, with lower and upper limits of 335 and 505. The induced incomes would be $9,240,000 with lower and upper limits of $7,370,000 and $11,110,000.

Step 5. Calculate total economic impacts.

The total impacts can then be estimated by summing the direct and induced employment and payroll impacts. In the example, 1,260 jobs would be attributed to the airport, with limits of 1,005 and 1,515. In addition, the airport would be credited with adding incomes totalling $27,720,000 to the region, with lower and upper limits of $22,110,000 and $33,330,000.

The discussion of the interpretation of rule-of-thumb estimates for high activity airports also applies here. The caveats regarding the noninclusion of airport expenditures and indirect impacts apply here as well.

General Aviation Airports

At an airport where the principal use is by general aviation, the five steps outlined above should be followed. In Step 1, employment and payroll data may be available from the airport manager. The scant data on GA airports suggests a rough ratio of one employee for every 7.2 based aircraft,[1] but this may

---

[1] From data on fixed base operators by employment-size class, reported in the 1980 Survey of Airport Services (24), median FBO employment, including the FBO manager, is 4.5 for the nation as a whole. The average number of FBO's per airport is 1.1. Average FBO employment at an airport is thus 1.1 times 4.5, or approximately 5.0. The average number of permanently based aircraft per airport is 36.2. This figure divided by the average airport FBO employment of 5.0 yields a ratio of 7.2 based aircraft per FBO employee.

be lower at small airports and higher at large ones. Local expenditures may also be determined and added to the direct payroll impacts. Steps 2 through 5 could then be carried out as described above.

Table 3-1 illustrates the application of rule-of-thumb procedures to airports of various activity levels. These activity levels correspond to those in Table 2-2. The principal advantage of the rules of thumb proposed in this section is that their implementation requires little time and a minimum of resources. However, they yield only rough approximations. A methodology for conducting a more thorough impact assessment is presented in the next section.

Estimates of employment and payrolls developed by the statistical rules of thumb can be projected by simply applying the same rules to forecasts of based aircraft and commercial passengers. For example, if the number of annual commercial passengers is expected to increase by 10,000 between the present and the year 2000 at an airport with fewer than four million commerical passengers a year, airport employment would be projected to increase by 8.4 (or 8). If airport payroll per employee is approximately $22,000 (in 1984 dollars), the increase in payrolls would be projected to be about $176,000. This would lead to an induced impact of $132,000, assuming a multiplier of 0.75, and thus a total increase in regional incomes of $308,000 a year.

3.3 Preparation of an Economic Impact Assessment

This section describes the methodology for conducting a detailed economic impact study. It identifies the phases in assessing an airport's economic impact and offers suggestions for implementing them. Particular emphasis is given to the preparation of the study design (Phase 2). Each phase is made up of specific tasks. Although the order in which the tasks are discussed suggests a chronological scheduling of research effort, the

TABLE 3-1

APPROXIMATE IMPACTS FOR VARIOUS ACTIVITY LEVELS

Airport Activity			Direct Impact[1]		Induced Impact[3]		Direct plus Induced Impact[4]	
Based Aircraft	Total Annual Commercial Passengers (including through passengers)	Estimated Employment[2]	Payroll per Employee	Total Payroll	Employment	Income	Employment	Income
10	0	1	$22,000	$ 22,000	1	$ 16,500	2	$ 38,500
20	0	3	22,000	66,000	2	49,500	5	115,500
50	0	7	22,000	154,000	5	115,500	12	269,500
100	0	14	22,000	308,000	11	231,000	25	539,000
50	50,000	42	22,000	924,000	32	693,000	74	1,617,000
100	100,000	84	22,000	1,848,000	63	1,386,000	147	3,234,000
100	1,000,000	840	22,000	18,480,000	630	13,860,000	1,470	32,340,000

1 Direct impacts in table include only employment and payrolls. Expenditures should be added if available.

2 Employment for the first four examples is estimated by the employment rule of thumb for GA airports: one employee for every 7.2 based aircraft. Employment for the last three examples is estimated by the employment rule of thumb for air carrier airports with fewer than four million commercial passengers a year: 8.4 employees for every 10,000 passengers. Employment estimates are rounded to the nearest integer.

3 In the examples shown in this table, it is assumed that 0.75 is the appropriate multiplier factor to be applied to the direct impact.

4 Indirect impacts are not shown, because no rule of thumb has been developed for estimating them.

tasks can often be carried out simultaneously or in some other order. Because of the relative complexity of the process and the extensive research and data collection that may be required, an individual or a small organization may not have the technical expertise and resources to carry out a detailed assessment, and professional assistance may be required.

Phase 1. Preliminary Planning

The planning phase of the assessment is critical, because it articulates the purpose and thus defines the orientation of the research effort. The planning phase also identifies the resources to be employed in carrying out the project. Phase 1 includes the following tasks:

Stating the Purpose of the Assessment

A statement of the purpose of the project will typically reflect some actual or perceived requirement. This could be a regulatory mandate related to airport development planning, or it might be a need to document an airport's economic contribution to an area to gain financial and/or political support for the facility.

The statement of purpose should indicate the target audience, e.g., state aviation officials, state and local elected officials, or the general public. If more than one audience is anticipated, it may be appropriate to publish the report in more than one format.

Formulating the Research Questions

The planning phase should specify the kinds of information, both general and specific, to be included in the final report. This information should include estimates of direct, indirect, induced, and total impacts. An examination of some prior

studies would be helpful in identifying additional, more specific kinds of information. Various studies have included such data as the average value of homes owned by airport employees, the average monthly rent paid by airport employees, the total number of people being supported by airport payrolls, and the annual expenditures of airport employees for food, housing, clothing, medical care, etc.

The regions to be covered by the study should be identified. Studies that identify the geograpnical boundaries of the affected regions can state their findings with greater specificity than those that do not.

It might be useful to assess future consequences as well as current impacts. This would be particularly useful for the preparation of airport master plans. Given this requirement, researchers would collect projections of such variables as enplaned passengers, airport employment, airport payrolls and expenditures, airport construction, air cargo, and general aviation operations.

Selecting the Project Resources

If the initiating agency does not have the time or the expertise to carry out the assessment project, all or part of the work can be contracted out. The selection of project resources will be shaped by the complexity of the task and the sponsoring agency's experience in conducting similar studies. Credible research has been performed by state agencies, trade associations, universities, and consulting firms.

Reviewing the Literature

If the project team is unfamiliar with the airport impact literature, a selective review of it is recommended. A literature survey would suggest the kinds of data that are available

and their sources. The literature falls into two general categories: methodologies and specific studies.

While some of the methodological literature emphasizes overall research strategy, some provides specific suggestions regarding the design of questionnaires (1), (3), (17). Some methodological advice is also related to the economic impacts of general aviation airports (9), (15).

Studies of the economic impacts of specific airports have been carried out for virtually every type of airport. These include large hub airports, e.g., (4), (16), medium hub airports, e.g. (2), (21), small hub airports, e.g., (14), (22), and reliever and general aviation airports, e.g., (10), (12).

Phase 2. Development of the Study Plan

Development of the study plan entails defining the research tasks required to answer the assessment questions posed in Phase 1, considering the methodological options for accomplishing these tasks, and then selecting specific procedures for collecting and analyzing data. If possible, it should be designed by the organization that will implement it. A contractor should develop the study plan in collaboration with the sponsoring agency to ensure that the research contributes effectively to the goals of the study. The methodology should be organized in terms of the tasks of estimating the airport's direct, indirect, induced, and total economic impacts as follows:

Direct Impacts

The starting point of developing a research strategy for estimating direct impacts should be a clear statement of what those impacts are for the particular airport under study. In general, an airport's direct impacts are the immediate economic consequences of employing labor, purchasing locally-produced goods and

services, and contracting for airport construction and capital improvements by airlines, fixed base operators, aviation-related facilities, and other businesses operating at the airport. Direct impacts originate at the airport, but some, like expenditures for locally-produced supplies, are felt away from the airport site. Decisions can then be made regarding which impacts to quantify.

The direct impacts selected for quantification should then be linked with specific impact measures. The principal measures of on-site direct impacts are airport employment, airport payrolls, and expenditures for capital construction. Measures of off-site direct impacts include airport expenditures for materials, equipment, fuel, and utilities.

Airport businesses can be cited as promising sources of data for estimating direct impacts. These businesses include the airport's airlines, concessions, fixed base operators, air cargo operators, other tenants, and aviation-related businesses. If project resources permit, personal interviews should be specified as the means of collecting data. Personal interviews are preferable to mailed questionnaires, because they ensure that each question is understood and answered completely and unambiguously.

Although the survey probably should be tailor-made to accommodate the unique characteristics of the airport being studied, the study plan should provide for the study of questionnaires that have been used in other airport impact assessments. (These are often presented in appendices of reports.)

The following kinds of information regarding each airport tenant are likely to be useful in subsequent analysis, and these should be specified:

1. Type of business (airline, rental car agency, restaurant, gift shop, fixed base operator, air freight operator, etc.)

2. Number of employees working at the airport or providing support services

3. Total annual payroll of these employees

4. Local expenditures during the past year on materials and equipment, vehicle fuel, aviation fuel, maintenance and repair, advertising, electricity, telephone service, and capital improvements at the airport.

5. Annual total dollar sales (especially if the RIMS II approach is to be used; see pp. 33-34.)

An example of an effective two-page questionnaire for obtaining information from an airport's tenants is the form that was developed for a study of the Harrisburg International Airport (18). This is presented in Appendix E.

The end product of this task should be a set of data on such variables as airport sales, employment, payrolls, and expenditures. These data, along with data on indirect impacts, will be components of the total estimated impacts. They will also be used in the estimation of induced impacts.

Indirect Impacts

The study design should outline procedures for measuring impacts derived from economic activities of off-site enterprises that serve the airport's users, e.g., travel agencies, hotels, restaurants, and retail stores. Like airport businesses, they too employ workers, purchase locally produced goods and services, and invest in capital projects. The following suggestions concerning estimation of the economic activities of (a) travel agencies and (b) enterprises that serve tourists and other visitors who fly into the airport may be incorporated into the project's research strategy.

Travel agency data should be collected directly by interview or a mailed questionnaire. If the region has a large number of travel agencies, a sample survey should be considered. The kind of information to be obtained is essentially the same as that collected from airport tenants, i.e., data on employment, payrolls, and expenditures. It is particularly important that the agencies estimate the percentage of their business that is related to local use of the airport.

Data on local expenditures of tourists and other visitors to the area who arrive at the airport can be estimated by a survey of hotels and travel agencies or obtained by an air passenger survey. Prior to the survey, a meeting should be held with airport management to gain its cooperation and to plan a sampling procedure that will not interfere with airport operations.

Information to be requested from departing non-local passengers should include the following:

1. Principal purpose of visiting the area (business, convention, vacation, etc.)

2. The number of trips to the airport in the past year

3. The number of days spent in the area

4. The approximate sums of money spent locally on lodging, food and beverages, gifts, entertainment, transportation, etc.

The questionnaire used in the study of the Harrisburg International Airport is presented in Appendix E. These sample data are then the basis for extrapolating total annual expenditures by tourists and other visitors to the area. The expenditure patterns of hotels, restaurants, and other enterprises that cater to visitors do not have to be determined unless, as

discussed below, highly refined estimates of induced impacts are desired.

The final output of this task should be a set of estimates of such measures as

(1) airport-related employment, payrolls, and local expenditures of travel agencies, and

(2) annual expenditures of tourists and other visitors for lodging, food, entertainment, gifts, etc.

Induced and Total Impacts

The study design should specify a procedure for measuring induced impacts, the result of successive rounds of spending that originate with the direct and indirect impacts discussed above. The sum of the direct, indirect, and induced impacts represents the total employment and income impacts of the airport.

Induced impacts are typically measured by multiplying the sum of the direct and indirect impacts by some factor. Some past studies applied different multiplier factors to individual components of direct and indirect impacts. As discussed above, multiplier values should reflect the peculiar economic characteristics of the region in which the airport is located, especially the extent to which the region is economically self sufficient. Development of the study design requires consideration of the following three options for estimating induced impacts: the economic base model, an econometric model, and a regional input-output model.

One approach to estimating [illegible] multipliers is the economic base model (13). This model relates changes in goods sold within the region ("[illegible]") to changes in goods sold outside the [illegible] simple

in theory and inexpensive to construct. However, because it divides local economic activity into only two broad categories, the economic base multiplier is an average for the entire basic sector, and this may not accurately reflect the specific induced consequences of the airport's direct and indirect impacts. In addition the classification of a region's industries as either basic or service is somewhat arbitrary. For example, manufacturing, which is typically classified as a basic sector, often has some local orientation, e.g., food processing and printing. Also, banking, a service sector, may serve a market larger than the region being studied. Despite these limitations, however, the economic base model has been widely used for regional economic analysis.

A second approach is to develop an econometric model of the region that quantifies the relationships among a number of key economic variables, e.g., income, consumption expenditures, and the regional price level (13). These models are similar in nature to macroeconomic models of national economies and are usually based on time series data. Regression analysis is the principal statistical tool used to estimate the economic relationships. Regional econometric models are capable of estimating a single multiplier, and this can then be applied to the estimated direct and indirect impacts to derive the total economic impacts of the airport. Assistance for developing or applying this kind of model can typically be obtained from an economic consulting firm or a university.

Econometric models developed for regional analysis have two principal limitations. First, most of the required data are often available only at the state and metropolitan area levels. County level modeling may thus not be possible. Second, regional models tend to be costly to develop in terms of time and labor.

A third approach is to use an input-output (I-O) framework of analysis. This is particularly useful for taking into

account the dependency of each economic sector on every other sector. This approach will also yield estimates of the differential multiplier effects of direct and indirect impacts on separate regional sectors.

Regional I-O models can be constructed with region-specific data, but they are frequently based on a national I-O table. Adjustments are then made on the basis of key differences between the region's economy and that of the nation. Because the development of a regional I-O model requires a great amount of detailed data analysis and a knowledge of I-O theory, it may be appropriate to seek assistance from a consulting firm or university research unit with experience in I-O analysis.

An alternative solution is to purchase multiplier factors estimated for the region from the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce. These factors are available for any county or set of contiguous counties in the United States. At present (1985), the cost of these multipliers is $1,500 per region, regardless of the number of counties in the region.

The BEA's Regional Input-Output Modeling System (RIMS II) multipliers are derived from the national input-output (I-O) table, which shows the input and output structure of 531 U.S. industries. The national I-O matrix is made region specific by the use of location quotients, which are measures of a regional industry's share of total regional economic activity relative to that industry's share of national economic activity. A technical discussion of the derivation of the RIMS II multipliers is found in the BEA's Regional Input-Output Modeling System (23). RIMS II multipliers have been used in impact studies of a number of airports, e.g., Anchorage International Airport (5), Jacksonville International Airport (7), Roanoke Regional Airport (19), and Washington National Airport (11).

Each set of RIMS II multipliers includes three tables: an employment multiplier table, a total earnings multiplier table, and a total multiplier table. In addition, BEA will provide a household direct coefficient table upon request. The total earnings multipliers are the most relevant for the economic impact assessment. They can be applied to either a general category of expenditures, e.g., airline expenditures, or to specific expenditure items, e.g., airline expenditures on up to 39 separate classifications of items, e.g., fuel and maintenance and repair. More refined estimates of multiplier effects can be obtained by applying separate multipliers to individual expenditure components.

RIMS II multipliers can thus be used to estimate the airport's total impact on employment and income, both for the region as a whole and, if desired, for specific industries within the region. It should be noted that the application of the RIMS II multipliers leads directly to total impacts and does not identify induced impacts explicitly. These, however, can be calculated by simply subtracting direct and indirect impacts from the total. An example of the use of RIMS II multipliers is presented in Appendix F.

Impacts of Increased Activity

If one of the objectives of the study is to estimate the economic impacts of future planned or anticipated changes in the use of the airport, provision must be made to forecast shifts in passenger demand. An airport's economic impacts, like its benefits, can be expected to change over time as airport activity changes. Economic impacts can be projected into the future by using the estimated relationship between airport employment and the number of commercial passengers shown in Figures A-1 and A-2 in Appendix A. However, an adjustment should be made to reflect productivity improvements that are expected in the economy. Productivity increases on the order

of two percent per year in airline costs and employment and one percent per year in other sectors may be anticipated.

Phase 3. Implementation of [illegible] Plan

Given a plan of study, the actual conduct of the research would reflect the emphasis, availability of data, and time and resources available. Some general program management techniques are useful in scheduling and coordinating the effort. These responsibilities are made easier by the development of a scheduling diagram that shows the interrelationships among project tasks in a chronological fashion. Diagrams of the sort used by such network techniques as the Critical Path Method (CPM) and the Program Evaluation and Review Technique (PERT) are particularly useful.

Additionally, provisions should be made for [illegible] assessments of the continued applicability of the [illegible] within the study plan. These are needed [illegible] and adjustments to the study plan [illegible] by unforeseen early successes [illegible]

Phase 4. Presentation and review [illegible] Report

The successful completion [illegible] in a draft report suitable [illegible] be a detailed account [illegible] techniques employed, [illegible] the research. Subsequent [illegible] should be incorporated [illegible]

The review process [illegible] the accuracy of the results [illegible] and eventual [illegible] organizations [illegible]

or who may be affected by the study should provide comments. This will reduce the chance that institutional detail having important implications to the study results is not overlooked.

Finally, an effort should be made to publicize and distribute the results of the study. An initial program to introduce the study findings may include a press release, a briefing for representatives of the media, and a letter report to interested parties. Magazine or newspaper inserts may be prepared and financed by advertising from airport tenants and their suppliers. Reports for distribution to the general public are typically short brochures that present the principal findings of the research.

CHAPTER 4

SUMMARY

Analytical techniques are available to quantify the transportation benefits and the economic impacts of airports. Rules of thumb, consistent with those analytical techniques, can provide preliminary but imprecise estimates by relating airport activity to benefits and to economic impact in terms of the jobs and payroll that result from the airport. Table 4-1 illustrates typical figures for airports with various activity levels.

These analytical techniques can also be used to predict the positive economic effects that are likely to result from increased aeronautical activity. For instance, if an airport with fewer than four million commercial passengers per year is forecast to have 50 additional based aircraft and 50,000 additional annual commercial passengers 10 years in the future, then it can be expected that there will be an accompanying increase in benefits of about $1,284,165 per year, and 74 jobs will be added to the local economy with a payroll impact of $1,617,000 per year.

TABLE 4-1

APPROXIMATE BENEFITS AND IMPACTS FOR VARIOUS ACTIVITY LEVELS

Based Aircraft	Annual Commercial Passengers	Benefits: Value of Time Saved	Benefits: Reduction in Travel Cost	Benefits: Total Annual Benefit	Direct Plus Induced Impact: Annual Payroll	Direct Plus Induced Impact: Number of Jobs
10	0	$ 83,333	$ 14,400	$ 97,733	$ 38,500	2
20	0	166,666	28,800	195,466	115,500	5
50	0	416,665	72,000	488,665	269,500	12
100	0	833,330	144,000	977,330	539,000	25
50	50,000	972,165	312,000	1,284,165	1,617,000	74
100	100,000	1,944,330	624,000	2,568,330	3,234,000	147
100	1,000,000	11,943,330	4,944,000	16,887,330	32,340,000	1,470

APPENDIX A

RELATION BETWEEN AIRPORT EMPLOYMENT AND COMMERCIAL PASSENGERS

The rules of thumb presented in Section 3.2 for estimating an airport's employment on the basis of annual commercial passengers, including through passengers, are developed from simple regression analysis. The statistical evidence at hand suggests that employment at airports having more than 4 million commercial passengers a year is slightly more responsive to commercial passengers than is employment at airports having less than 4 million commercial passengers. Accordingly, two separate regressions were run.

Figure A.1 shows the plot of points and the estimated regression line for the airports in the sample having less than 4 million passengers a year (Table A-1). The equation of the regression line is

Airport employment = 0.8395 commercial passengers (thousands).

The r-square between observed and predicted airport employment is 0.4450. The t value of 13.370 with 61 degrees of freedom indicates that the regression coefficient is statistically significant at the 1 percent level. It will be noted that the intercept term in the regression has been suppressed (for simplicity), but in a separate regression that permitted an intercept term, the difference between the estimated intercept and zero was found to be not statistically significant.

Figure A.2 shows the data points and the estimated regression line for the airports in the sample having more than 4 million commercial passengers (Table A-2). The regression line is

Figure A–1

AIRPORTS WITH FEWER THAN 4M PASSENGERS

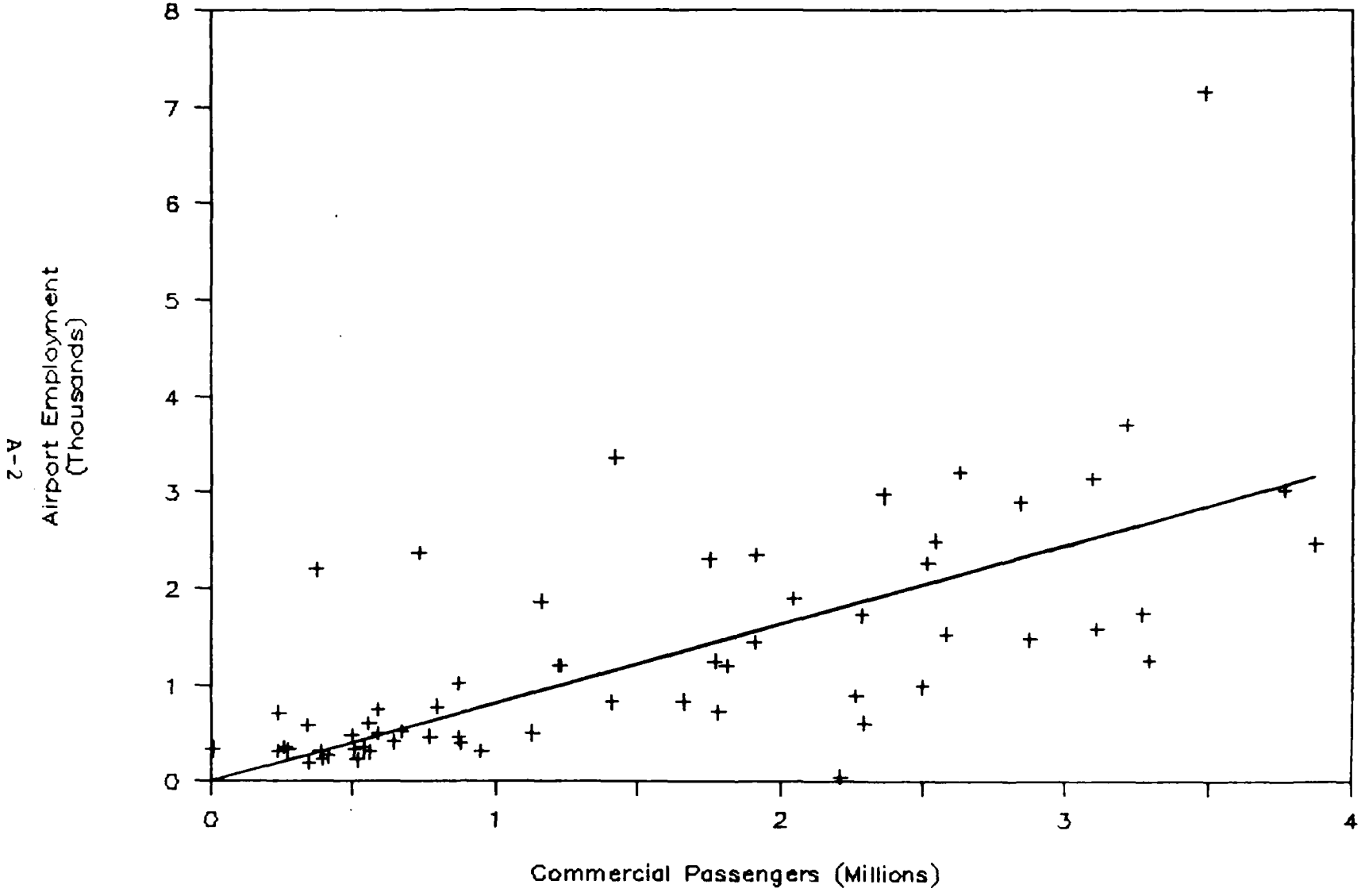


TABLE A-1

Airport Employment and Commercial Passengers for Airports with Fewer than Four Million Passengers a Year, 1981

AIRPORT	EMPLOYMENT	PASSENGERS (Millions)
EAST FARMDALE REPUBLIC	343	0.004
SANTA ANA JOHN WAYNE	1725	2.286
LIHUE	57	2.212
AUSTIN MUELLER	718	1.784
HOUSTON HOBBY	1743	3.269
BURBANK-GLENDALE-PASADENA	2345	1.917
RALEIGH-DURHAM	1250	1.774
CHARLOTTE	1592	3.111
SACRAMENTO	889	2.267
GREENSBORO/HIGH POINT/W-S	824	1.41
SAN JOSE	1480	2.877
ALBUQUERQUE INTERNATIONAL	612	2.296
CHARLESTON INTERNATIONAL	320	0.947
CEDAR RAPIDS	307	0.56
PALM BEACH INTERNATIONAL	1532	2.583
ASHEVILLE	194	0.345
SAN ANTONIO	3705	3.209
PORTLAND (OR)	2464	3.871
DATONA BEACH	467	0.768
ALLENTOWN-BETHLEHEM-EASTON	752	0.588
MOLINE QUAD CITY (IL)	501	0.587
FORT MYERS LEE COUNTY	506	1.128
INDIANAPOLIS INTERNATIONAL	3157	3.091
RENO CANNON INTERNATIONAL	983	2.502
SYRACUSE HANCOCK	838	1.663
EL PASO INTERNATIONAL	1444	1.913
BATON ROUGE RYAN	351	0.536
COLUMBUS	2500	2.541
GREENVILLE-SPARTANBURG	522	0.667
NASHVILLE	2267	2.517
MILWAUKEE MITCHELL	1260	3.296
FREELAND TRI-CITY (MI)	243	0.394
LEXINGTON BLUE GRASS	411	0.641
FORT WAYNE BAER	473	0.494
LOUISVILLE STANDIFORD (KY)	1902	2.046
CINCINNATI INTERNATIONAL	2895	2.84
ONTARIO (CA)	2979	2.36
BALTIMORE-WASHINGTON INTERN	3023	3.764
WICHITA MID-CONTINENT	1866	1.159
DAYTON INTERNATIONAL	1201	1.816
RICHMOND BYRD	1194	1.227
WASHINGTON DULLES	3211	2.624

TABLE A-1 (Continued)

AIRPORT	EMPLOYMENT	PASSENGERS (Millions)
SAVANNAH	2374	0.73
BURLINGTON INTERNATIONAL	265	0.414
DES MOINES	1194	1.224
PENSACOLA	327	0.503
FRESNO	1011	0.87
TOLEDO EXPRESS	600	0.555
COLUMBIA (SC)	394	0.877
JACKSONVILLE	2300	1.753
SPRINGFIELD REGIONAL (MO)	353	0.258
KALAMAZOO	315	0.237
MELBOURNE (FL)	2196	0.37
CHATTANOOGA	225	0.515
KNOXVILLE TYSON	456	0.87
BIRMINGHAM	3365	1.419
DALLAS (LOVE)	7150	3.488
LINCOLN	579	0.341
SOUTH BEND MICHIANA	310	0.385
GREAT FALLS (MT)	330	0.272
JACKSON THOMPSON (MS)	776	0.794
SPRINGFIELD CAPITAL	716	0.237

Source: Airport Operators Council International

Figure A–2

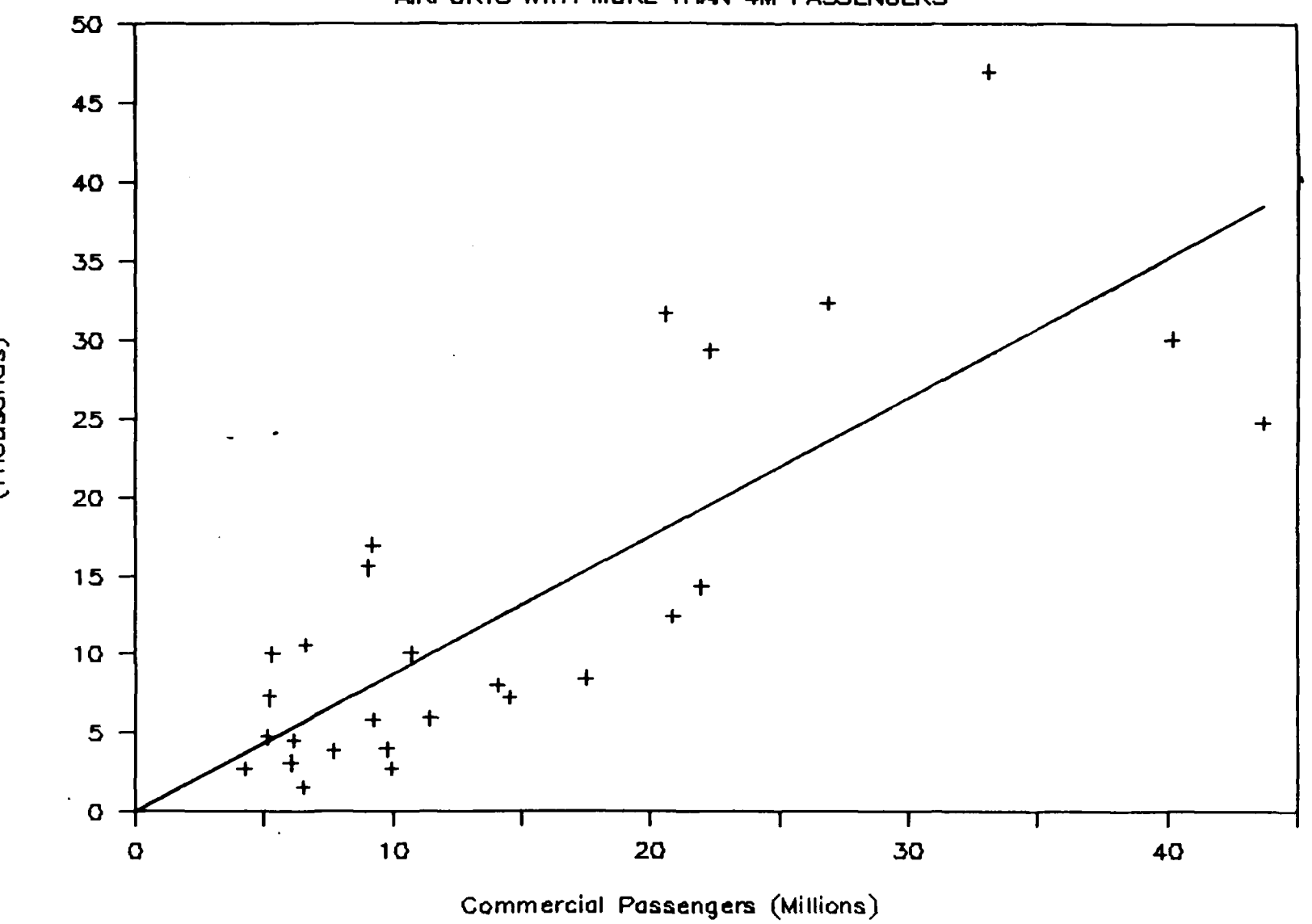

AIRPORTS WITH MORE THAN 4M PASSENGERS
Airport Employment (Thousands)
50
45
40
35
30
25
20
15
10
5
0
0
10
20
30
40
Commercial Passengers (Millions)

TABLE A-2

Airport Employment and Commercial Passengers for Airports with More than Four Million Passengers a Year, 1981

AIRPORT	EMPLOYMENT	PASSENGERS (Millions)
CHICAGO-O'HARE	24727	43.653
HONOLULU	8000	14.036
LOS ANGELES	46971	33.038
LA GUARDIA	8419	17.459
NATIONAL	7216	14.538
DALLAS-FT.WORTH	14253	21.951
ATLANTA-HARTSFIELD	30000	40.148
SAN FRANCISCO	29260	22.248
HOUSTON INT.	10000	10.695
MIAMI	31583	20.505
DENVER-STAPLETON	12400	20.849
LAS VEGAS MCCARRAN	2751	9.929
PITTSBURGH	5901	11.453
SAN DIEGO-LINDBERGH	4750	5.165
FORT LAUDERDALE	3181	6.025
KENNEDY	32287	26.796
TAMPA INT.	3842	7.689
MINNEAPOLIS-ST. PAUL	15528	9.024
DETROIT METRO	4000	9.759
SEATTLE-TACOMA	16900	9.194
CLEVELAND	4553	6.123
PHOENIX-SKY HARBOR	10600	6.586
ORLANDO	1603	6.532
NEWARK	5824	9.223
SALT LAKE CITY	2760	4.244
KANSAS CITY INT.	10000	5.306
MEMPHIS	7331	5.216

Source: Airport Operators Council International

Airport employment = 0.8793 commercial passengers (thousands).

The r-square between observed and predicted airport employment is 0.6199, and the t value of 11.482 with 26 degrees of freedom indicates that the regression coefficient is statistically significant at the 1 percent level. In a separate regression, the intercept term was not significantly different from zero.

APPENDIX B

FAA REGIONAL OFFICES

NEW ENGLAND REGION

Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut

Regional Office: Airports Division, ANE-600
Federal Aviation Administration
12 New England Executive Park
Burlington, Massachusetts 01803

Comm. Telephone: 617-273-7044

EASTERN REGION

New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, and District of Columbia

Regional Office: Airports Division, AEA-600
Federal Aviation Administration
Fitzgerald Federal Building, Room 329
John F. Kennedy International Airport
Jamaica, New York 11430

Comm. Telephone: 718-917-1239

SOUTHERN REGION

Georgia, North Carolina, South Carolina, Florida, Puerto Rico, Virgin Islands, Tennessee, Kentucky, Mississippi, and Alabama

Regional Office: Airports Division, ASO-600
Federal Aviation Administration
3400 Norman Berry Drive
East Point, Georgia 30344

Comm. Telephone: 404-763-7288

Mail: Airports Division, ASO-600
Federal Aviation Administration
P.O. Box 20636
Atlanta, Georgia 30320

GREAT LAKES REGION

Illinois, Indiana, Michigan, Wisconsin, Minnesota, Ohio, North Dakota, and South Dakota

Regional Office: Airports Division, AGL-600
Federal Aviation Administration
2300 East Devon Avenue
Des Plaines, Illinois 60018

Comm. Telephone: 312-694-7272

CENTRAL REGION

Kansas, Missouri, Iowa, and Nebraska

Regional Office: Airports Division, ACE-600
Federal Aviation Administration
Federal Building
601 East 12th Street
Kansas City, Missouri 64106

Comm. Telephone: 816-374-5278

NORTHWEST MOUNTAIN REGION

Washington, Idaho, Oregon, Colorado, Wyoming, Utah, and Montana

Regional Office: Airports Division, ANM-600
Federal Aviation Administration
17900 Pacific Highway South
C-68966
Seattle, Washington 98168

Comm. Telephone: 206-431-2600

WESTERN-PACIFIC REGION

California, Arizona, Nevada, Hawaii, Trust Territory of the Pacific Islands, American Samoa, Guam, Commonwealth of Northern Marianas Islands

Regional Office: Airports Division, AWP-600
Federal Aviation Administration
15000 Aviation Boulevard
Lawndale, California 90261

Comm. Telephone: 213-536-6240

FTS: 8-966-6240

Mail: Airports Division, AWP-600
Federal Aviation Administration
P.O. Box 92007, Worldway Postal Center
Los Angeles, California 90009

SOUTHWEST REGION

Arkansas, Texas, Oklahoma, New Mexico, and Louisiana

Regional Office: Airports Division, ASW-600
Federal Aviation Administration
4400 Blue Mound Road
Fort Worth, Texas 76131

Comm. Telephone: 817 [illegible]

Mail: Airports Division, ASW-600
Federal Aviation Administration
P.O. Box 1689
Fort Worth, Texas 76106

ALASKAN REGION

Regional Office: Airports Division, AAL-600
Federal Aviation Administration
Anchorage Federal Office Building
701 C Street, Box 14
Anchorage, Alaska 99513

Comm. Telephone: 907-271-5438

APPENDIX C

STATE AVIATION AGENCIES

Alabama

Director
Alabama Dept. of Aeronautics
817 South Court Street
Montgomery, AL 36130-0101
Telephone: 205 + 261-4480

Alaska

Director
Central Reg. Planning
Dept. of Transportation &
Pub. Facs.
Mail Pouch 6900
Anchorage, AK 99502
Telephone: 907 + 266-1462

Arizona

Director
Division of Aeronautics - DOT
1801 W. Jefferson, Room 426
Phoenix, AZ 85007
Telephone: 602 + 255-7691

Arkansas

Director
Arkansas Dept. of Aeronautics
Adams Field-Old Terminal Bldg.
Little Rock, AR 72202
Telephone: 501 + 376-6781

California

Chief
Division of Aeronautics - DOT
1120 N Street
Sacramento, CA 95814
Telephone: 916 + 322-3090

Colorado

Airport Planning Staff
Colorado Dept. of Local Affairs
1313 Sherman Street, Suite 520
Denver, CO 80203
Telephone: 303 + 866-2352

Connecticut

Deputy Commissioner
Bureau of Aeronautics - DOT
P.O. Drawer A
Wethersfield, CT 06109
Telephone: 203 + 566-4417

Delaware

Administrator
Aeronautics Section
Delaware Transportation Authority
P.O. Box 778
Dover, DE 19903
Telephone: 302 + 736-3264

Florida

Chief
Bureau of Aviation - DOT
Burns Building
605 Suwannee Street
Tallahassee, FL 32301
Telephone: 904 + 488-8444

Georgia

Chief
Bureau of Aeronautics - DOT
2017 Flightway Drive
Chamblee, GA 30341
Telephone: 404 + 393-7353

Hawaii

Administrator
Airports Division - DOT
Honolulu International Airport
Honolulu, Hawaii 96819
Telephone: 808 + 836-6432

Idaho

Administrator
Division of Aeronautics - DOT
3483 Rickenbacker Street
Boise, ID 83705
Telephone: 208 + 334-3183

Illinois

Director
Division of Aeronautics - DOT
Capital Airport
One Langhorne Bond Dr.
Springfield, IL 62706
Telephone: 217 + 753-4400

Indiana

Deputy Director
DOT - Division of Aeronautics
143 West Market St., Suite 300
Indianapolis, IN 46204
Telephone: 317 + 232-1470

Iowa

Director
Aeronautics Division - DOT
State House
Des Moines, IA 50319
Telephone: 515 + 281-4280

Kansas

Director of Aviation
Department of Transportation
State Office Building
Topeka, KS 66612
Telephone: 913 + 296-2553

Kentucky

Executive Director
Office of Aeronautics &
Riverport Development
Kentucky Transportation Cabinet
State Office Building
Frankfort, KY 40622
Telephone: 502 + 564-4480

Louisiana

Assistant Secretary
DOT - Office of Aviation
P.O. Box 44245 - Capitol Station
Baton Rouge, LA 70804
Telephone: 504 + 342-7728

Maine

Director
Divison of Aeronautics - DOT
State Office Building
Augusta, ME 04333
Telephone: 207 + 289-3185

Maryland

Administrator
Maryland Aviation Administration
P.O. Box 8766
Baltimore/Washington
International Airport, MD 21240
Telephone: 301 + 859-7100

Massachusetts

Director
Massachusetts Aeronautics Commission
10 Park Plaza, Room 6620
Boston, MA 02116-3966
Telephone: 617 + 973-7350

Michigan

Director
Michigan Aeronautics Commission
Capital City Airport
Lansing, MI 48906
Telephone: 517 + 373-1834

Minnesota

Assistant Commissioner
DOT - Aeronautics Division
Transportation Building
St. Paul, MN 55155
Telephone: 612 + 296-8202

Mississippi

Director
Mississippi Aeronautics Commission
P.O. Box 5
Jackson, MS 39205
Telephone: 601 + 359-1270/1272

Missouri

Director of Aviation
Dept. of Highways &
Transportation
P.O. Box 270
Jefferson City, MO 65102
Telephone: 314 + 751-2589

Montana

Administrator
Montana Aeronautics Division
P.O. Box 5178
Helena, MT 59604
Telephone: 406 + 444-2506

Nebraska

Director
Nebraska Dept. of Aeronautics
P.O. Box 82088
Lincoln, NE 68501
Telephone: 402 + 471-2371

Nevada

Assistant Director - Planning
Department of Transportation
1263 South Stewart Street
Carson City, NV 89712
Telephone: 702 + 885-5440

New Hampshire

Director
New Hampshire Aeronautics
Commission
Municipal Airport
Concord, NH 03301
Telephone: 603 + 271-2551

New Jersey

Director
Division of Aeronautics - DOT
1035 Parkway Avenue
Trenton, NJ 08625
Telephone: 609 + 292-3020

New Mexico

Director
Aviation Division - DOT
P.O. Box 579
Santa Fe, NM 87504-0579
Telephone: 505 + 827-4590

New York

Director
Aviation Bureau
NYS Department of Transportation
1220 Washington Avenue
Albany, NY 12232
Telephone: 518 + 457-2820

North Carolina

Director
Division of Aviation - DOT
P.O. Box 25201
Raleigh, NC 27611
Telephone: 919 + 787-9618

North Dakota

Director
North Dakota Aeronautics Commission
Box 5020
Bismarck, ND 58502
Telephone: 701 + 224-2748

Ohio

Deputy Director
DOT - Division of Aviation
2829 West Granville Road
Worthington, OH 43085
Telephone: 614 + 466-7120

Oklahoma

Director
Oklahoma Aeronautics Commission
Department of Transportation Bldg.
200 N.E. 21st St. - Room B-7
Oklahoma City, OK 73105
Telephone: 405 + 521-2377

Oregon

Administrator
Oregon Division of Aeronautics
3040 25th Street S.E.
Salem, OR 97310
Telephone: 503 + 378-4880

Pennsylvania

Director
Bureau of Aviation
PA Department of Transportation
Transportation & Safety Building
Room 716
Harrisburg, PA 17120
Telephone: 717 + 783-2280

Puerto Rico

Executive Director
Puerto Rico Ports Authority
G.P.O. 2829
San Juan, Puerto Rico 00936
Telephone: 809 + 723-0698

Rhode Island

Assistant Director
DOT - Division of Airports
Theodore F. Green State Airport
Warwick, RI 02886
Telephone: 401 + 737-4000

South Carolina

Director
South Carolina Aeronautics
Commission
Drawer 1987
Columbia, SC 29202
Telephone: 803 + 758-2766

South Dakota

Assistant Director
Department of Transportation
700 Broadway Avenue E.
Pierre, SD 57501-2585
Telephone: 605 + 773-3265

Tennessee

Administrator
Office of Aeronautics - DOT
P.O. Box 17326
Nashville, TN 37217
Telephone: 615 + 741-3208

Texas

Director
Texas Aeronautics Commission
P.O. Box 12607, Capitol Station
Austin, TX 78711
Telephone: 512 + 476-9262

Utah

Director
Aeronautics Division - DOT
135 North 2400 West
Salt Lake City, UT 84116
Telephone: 801 + 328-2066

Vermont

Director of Operations
Agency of Transportation
State Administration Bldg.
133 State Street
Montpelier, VT 05602
Telephone: 802 + 828-2828

Virginia

Director
Department of Aviation
P.O. Box 7716
Richmond, VA 23231
Telephone: 804 + 786-6284

Washington

Assistant Secretary
DOT - Division of Aeronautics
8600 Perimeter Road - Boeing Field
Seattle, WA 98108
Telephone: 206 + 764-4131

West Virginia

Director of Community Development
Bldg. 6, B-553 - State Capitol Complex
Charleston, WV 25305
Telephone: 304 + 348-4010

Wisconsin

Director
Bureau of Aeronautics - DOT
P.O. Box 7914
Madison, WI 53707
Telephone: 608 + 266-3351

Wyoming

Director
Wyoming Aeronautics Commission
State of Wyoming
Cheyenne, WY 82002
Telephone: 307 + 777-7481

Guam

Executive Manager
Guam Airport Authority
P.O. Box 8770
Tamuning, Guam 96911
Telephone: 671 + 646-0300

APPENDIX D

AVIATION ASSOCIATIONS

Association	Head	Phone
Aerospace Industries Association of America, Inc. 1725 DeSales Street, NW Washington, DC 20036	President Karl G. Harr, r.	202-429-4600
Air Line Pilots Association International 535 Herndon Parkway P.O. Box 1169 Herndon, Virginia 22070	President Capt. Henry A. Duffy	703-689-2270
Air Transport Association of America 1709 New York Avenue, NW Washington, DC 20006	President Paul R. Ignatius	202-626-4000
Aircraft Owners & Pilots Association 421 Aviation Way Frederick, Maryland 21701	President John Baker	301-695-2000
Airport Operators Council International, Inc. Suite 602 1700 K Street, NW Washington, DC 20006	Executive Director J. Donald Reilly	202-296-3270
American Association of Airport Executives 4224 King Street Alexandria, Virginia 22302	Exec. Vice President Charles "Chip" Barclay	703-824-0500
Experimental Aircraft Association P.O. Box 2591 Oshkosh, Wisconsin 54903	President Paul H. Poberezny	414-426-4800
General Aviation Manufacturers Association Suite 801 1400 K Street, NW Washington, DC 20005	President Edward W. Stimpson	202-393-1500
Helicopter Association International 1619 Duke Street Alexandria, Virginia 22314-3406	President Frank L. Jensen, Jr.	703-683-4646

Association	Head	Phone
National Air Transportation Association, Inc. 4226 King Street Alexandria, Virginia 22302	President Lawrence L. Burian	703-845-9000
National Association of State Aviation Officials Suite 717 777 14th Street, NW Washington, DC 20005	Exec. Vice President Robert T. Warner	202-783-0588
National Business Aircraft Association, Inc. 1200 Eighteenth Street, NW Washington, DC 20036	President John H. Winant	202-783-9000
Regional Airline Association Suite 700 1101 Constitution Avenue, NW Washington, DC 20036	President Duane Ekedahl	202-857-1170

APPENDIX E

SAMPLE QUESTIONNAIRES

A STUDY OF THE ECONOMIC IMPACT OF HARRISBURG INTERNATIONAL AIRPORT

Aviation Tenant Survey

As best possible, please provide the requested information using data for the Calender Year of 1982, or most recent 12-month period for which data is conveniently available. If the information requested does not apply to your organization, or is not available, please indicate N/A in the response blank provided. If you are providing data for a 12-month period other than Calendar Year 1982, please indicate the time frame to which the data applies: _____ to _____

1. **Which of the following categories best describes your business at Harrisburg International Airport (HIA)?**

   1. ☐ Airline
   2. ☐ Rental Car Agency
   3. ☐ Concession (e.g. Restaurant, Gift Shop)
   4. ☐ Government Organization
   5. ☐ Fixed Base Operator
   6. ☐ Military
   7. ☐ Corporate Aviation
   8. ☐ Air Freight
   9. ☐ Other (specify) _____

I. TOTAL METROPOLITAN IMPACT

The information obtained in this section will be used to estimate the economic benefit of HIA to the Harrisburg Area.

A. EMPLOYMENT AND PAYROLL

2. **How many full-time and part-time employees did your organization have directly at HIA?**

   Full-time _____

   Part-time _____

3. **What was the total 1982 payroll of your organization's employees located directly at HIA?**

   Full-time $ _____

   Part-time $ _____

4. **How many employees did your organization employ in the Harrisburg Area who were not located directly at HIA but provided support services to your business (e.g., city airline ticket offices, truck drivers for cargo operations)?**

   _____

5. **What was the total annual payroll of those employees not located directly at HIA who provided support services for your business?**

   $ _____

B. EXPENDITURES

6. **How much did your organization spend in the Harrisburg Area during the past year on the following items:**

   a. Materials and Equipment . . $_____

   b. Vehicle Fuel . . . . . $_____

   c. Aviation Fuel . . . . . $_____

   d. Other (specify)

   _____ . . . . . $_____

   _____ . . . . . $_____

   _____ . . . . . $_____

7. **How much did your organization spend in the Harrisburg Area during the past year on the following support services:**

   a. Maintenance and repair . . . $_____

   b. Advertising . . . . . $_____

   c. Electricity . . . . . $_____

   d. Natural Gas . . . . . $_____

   e. Telephone . . . . . $_____

   f. Other (specify)

   _____ . . . . . $_____

   _____ . . . . . $_____

   _____ . . . . . $_____

8. **How much did your company pay in 1982 for each of the following taxes?**

   a. Pennsylvania State sales and use taxes on goods purchased from off-airport firms . . . . . $_____

   b. All other Pennsylvania State taxes . . . . . $_____

   c. Aviation Fuel tax . . . . . $_____

   d. Vehicle Fuel tax . . . . . $_____

   e. Other Community taxes (specify)

   _____ . . . . . $_____

   _____ . . . . . $_____

   _____ . . . . . $_____

   _____ . . . . . $_____

C. REVENUE AND CAPITAL COSTS

9. **What was the gross revenue earned by your company from business at HIA during 1982?**

   $ _____

10. **How much did your company spend during the year (1982) on capital improvements at HIA (i.e., major purchase of equipment or major development projects)?**

    $ _____

11. **How much does your organization plan to spend on capital improvements to your exclusive facilities at HIA:**

    a. During 1983? . . . . . $_____

    b. During the 1984 to 1988 period? . . . . . $_____

    c. During the 1989 to 1993 period? . . . . . $_____

☐ Please check this box if you would like a copy of the brochure resulting from this study, and provide a mailing address below. (If you prefer not identifying your company on this questionnaire, simply send us a separate letter requesting a copy of the brochure.)

_____

_____

_____

If there is any other information which we can provide you, please feel free to indicate your questions or data needs.

_____

_____

_____

If you have any additional information which you would like to provide, please send it to:

Malcolm H. Klein
Aviation Planning Associates, Inc.
421 Arch Street
Cincinnati, Ohio 45202

Thank you for your cooperation!

A STUDY OF THE ECONOMIC IMPACT OF HARRISBURG INTERNATIONAL AIRPORT

Non-Aviation Tenant Survey

As best possible, please provide the requested information using data for the Calendar Year 1982, or most recent 12-month period for which data is conveniently available. If the information requested does not apply to your organization, or is not available, please indicate N/A in the response blank provided. If you are providing data for a 12-month period other than Calendar Year 1982, please indicate the time frame to which the data applies: _____ to _____

I. BUSINESS ACTIVITY

1. **Please check that general category which most appropriately describes the nature of your business and furnish a brief description of the type of products or service provided.**

	General Category	Type of Product or Service Provided
1.	☐ Agriculture, Forestry and Fishing	
2.	☐ Mining	
3.	☐ Construction	
4.	☐ Manufacturing	
5.	☐ Transportation and Public Utilities	
6.	☐ Wholesale Trade	
7.	☐ Retail Trade	
8.	☐ Finance, Insurance and Real Estate	
9.	☐ Services	
10.	☐ Public Administration	
11.	☐ Communications	
12.	☐ Other (Please Specify)	

II. TOTAL METROPOLITAN IMPACT:

The information obtained in this section will be used to estimate the economic benefit of Harrisburg International Airport (HIA) to the Harrisburg Area.

A. EMPLOYMENT AND PAYROLL

2. **How many full-time and part-time employees did your organization have directly at HIA?**

   Full-time _____

   Part-time _____

3. **What was the total 1982 payroll of your organization's employees located directly at HIA?**

   Full-time $ _____

   Part-time $ _____

B. EXPENDITURES

4. **What were your estimated expenditures during 1982 for materials and equipment (e.g., office supplies, furniture, vehicles, etc.) purchased in the Harrisburg Metropolitan Area?** ..... $_____

5. **What were your estimated expenditures during 1982 for services performed by other companies (e.g., utilities, dry cleaning, advertising) located in the Harrisburg Metropolitan Area?** ...$_____

6. **Have you completed, or are you in the process of completing, any major expansion or renovation projects at your facilities at HIA?**

   1. ☐ No 2. ☐ Yes

7. **If YES, approximately how much did you spend on these projects? (Give total if more than one project.)** ....$_____

8. **How much does your organization plan to spend on capital improvements to your exclusive facilities at HIA:**

   a. During 1983? .....$_____

   b. During the 1984 to 1988 period? .....$_____

   c. During the 1989 to 1993 period? .....$_____

C. TAXES

9. **Approximately how much did your company pay in state and local taxes during 1982?**

   State taxes paid $ _____

   Local taxes paid $ _____

III. LOCATION

10. **How important was the proximity to the Airport in your choice to locate at HIA?**

    1. ☐ Essential
    2. ☐ Important
    3. ☐ Not Important

11. **What other factors were important in your choice to locate at HIA?**

    _____

    _____

    _____

☐ Please check this box if you would like a copy of the brochure resulting from this study, and provide a mailing address below. (If you prefer not identifying your company on this questionnaire, simply send us a separate letter requesting a copy of the brochure.)

_____

_____

_____

_____

If there is any other information which we can provide you, please feel free to indicate your questions or data needs.

_____

_____

_____

_____

If you have any additional information which you would like to provide, please send it to:

Malcolm H. Klein
Aviation Planning Associates, Inc.
421 Arch Street
Cincinnati, Ohio 45202

Thank you for your cooperation!

A STUDY OF THE ECONOMIC IMPACT OF HARRISBURG INTERNATIONAL AIRPORT

Air Passenger Survey

Dear Passenger:

In order to better serve the air traveling public, the Pennsylvania Department of Transportation, in cooperation with the airlines serving Harrisburg International Airport, is seeking information about the air passengers departing from Harrisburg. This information, which you alone can provide, will help to shape the future of Harrisburg International Airport and will aid in determining the value of the Airport to surrounding communities.

All information you provide on this questionnaire will remain confidential, and only statistical summaries of this data will be published. Please place your completed questionnaire in the box provided in the gate area as you leave to board your flight.

Thank you for your cooperation.

Thomas D. Larson, P.E.
Secretary, Department of Transportation

ABOUT THIS FLIGHT

1. Please provide the following information for the flight on which you will be departing today.

   a. Airline _____

   b. Flight Number _____

   c. Today's Date _____

2. What is your principal reason for this trip? (Please check main reason only.)

   1. ☐ Business
   2. ☐ State Government Business
   3. ☐ Attend Convention
   4. ☐ Vacation
   5. ☐ Visit Friends or Relatives
   6. ☐ Attend School
   7. ☐ Military, Under Orders
   8. ☐ Other _____ (Please Specify)

3. What is the ultimate airport destination of your air trip today?

   (Airport/City) _____

4. Will you have to change planes to a different flight at another airport in order to reach your ultimate destination?

   1. ☐ No 2. ☐ Yes

   (IF YES, at what airport will you change planes? _____

5. How long will you be away from home on this air trip?

   1 ☐ leave and return on the same day
   2 ☐ 2 days
   3 ☐ 3 days
   4 ☐ 4 days
   5 ☐ 5 days
   6 ☐ more than 5 days (Please specify total number of days. _____)

6. How many bags did you check? _____

7. How many bags, including your briefcase, are you carrying on this flight with you?

II. ABOUT YOUR GROUND TRIP TO HARRISBURG INTERNATIONAL AIRPORT

8. From where did you start your ground trip to come directly to the Airport for this flight?

   1 ☐ A Private Residence
   2 ☐ A Place of Business
   3 ☐ Hotel / Motel
   4 ☐ Other _____ (Please Specify)

9. Wh... ...laces?

(If ... approximate add... ...city name.)

10. Wh... ...time from ... ground trip ... ...ed the terminal ...

...minutes

11. ... in the

12. ... available, wou... ...come to the Air...

13. ... ...tation is ... commuter ... Harrisburg ... had been ... the train to ...

III. FINAL ... ABOUT YOU... YOUR ANS... ...ING QUE... FOR STAT...

14. Du... ...uring all ... total air ... this trip?

15. ... area or ... listed below? ... which you are a ... a resident of any of ... provided)

16. How ma... ...made to Harrisburg, not inc... ...ns in the past 12 months? (Count ... round trip as one.)

17. How many days did you spend in the Harrisburg area or suburbs during this trip? ______

18. Approximately how ... did you spend on each of the following items during your stay in Harrisburg ... traveling with another individual ... those expenditures ...

Hotel/Motel ... $

Food and Bev... $

Retail Stores $

Sports Nigh... Entertainme...

Local Car ... Rental ...

Business-... and Services $

Other $

Total Expenditu... $

19. What major ... business, entertainment ... did you visit during this trip to Harrisburg?

20. The future ... plan for Harrisburg International Airport may identify the need for a hotel/conference center at the Airport. If the hotel/conference center had been available during your visit to Harrisburg, check the statement that best describes your situation.

1. ☐ ... the hotel ...
2. ☐ ... conference ... a business meeting ...
3. ☐ Both ... above
4. ☐ Not sure ... hotel ... making my plans for this ...
5. ☐ ... hotel ...

21. ... please make ... comments ... to Harrisburg ... Airport and how ... to the air passengers.

APPENDIX F

ESTIMATING ECONOMIC IMPACTS USING THE RIMS II MULTIPLIERS

This appendix describes the RIMS II multipliers, describes the manner in which they are used, and presents a sample set of calculations for determining regional impacts.[1] RIMS II multipliers are intended to show the total regional effects on industrial output, personal earnings and employment for any county or group of contiguous counties in the United States resulting from any industry activity. Industry descriptions are defined according to the 1977 Bureau of Economic Analysis (BEA) national input-output tables. Induced impacts for any airport-related businesses can be estimated by applying the RIMS II multipliers to activities within the air transportation industrial sector.

RIMS II multipliers are given in three tables: total output multipliers, earnings multipliers, and employment multipliers. In addition, BEA will also provide a household direct coefficient table upon request. The total output multiplier table is used to compute the total impact of a change in demand. These multipliers identify the demands placed on a particular region from the future growth of a business activity. The earnings multipliers measure the impacts on earnings (income) and employment. The employment multipliers are used in calculating the total number of jobs created by final changes in demand. Of the three sets of multipliers, the earnings multipliers are the most suitable for estimating the economic impacts of a particular business activity. The household direct coefficient table can be used

---

[1] Much of the [illegible] M. Wood, Recommended Regional Economic Impact Models for Aviation Related Projects, A Presentation to the Transportation Research Board, [illegible]

to determine sales of a particular regional industry when airport expenditures are the only available information.

Each aviation business related to a targeted airport is assigned a Standard Industrial Classification code. The aviation-related business is identified with a corresponding RIMS II code number. Table F-1 presents business activities that are most likely encountered in aviation-related economic studies. These activities can be matched with corresponding RIMS II code numbers. The RIMS II code number will identify the specific multiplier factor to be applied to the affected business.

The RIMS II model uses sales by aviation businesses to estimate the final demand at targeted airports. Business activities are evaluated and defined according to their level of economic consequences to the targeted airport. These activities are grouped into direct and indirect impacts. Business information gathered at each airport includes:

1. magnitude of sales
2. size of purchase
3. identity of purchase
4. number of employees
5. size of payroll

In general, sales should be multiplied by RIMS II multipliers to determine economic impacts. However, if data are lacking for some specific types of business activity, other information, such as expenditures, payroll earnings and number of employees can be used. The following calculations illustrate the RIMS II methods of computing economic impacts from data on airport sales, payroll and employment.

Table F-1

Aviation RIMS II Code Numbers

Business	RIMS II Number
AIRPORT MANAGEMENT	
Administration	650500
Construction	110400
AIRLINES	650500
FIXED-BASED OPERATORS	
Aircraft Servicing	650500
Aircraft Rental	720300
Aerial Spraying	010100
FEDERAL FACILITIES	
Air National Guard	780400
Air Traffic Control	650500
Airport Mail Facilities	650500
Airways Facilities	650500
Armed Forces	780400
Customs Patrol	650500
Forestry Service	040000
Weather Service	730300
ONSITE AVIATION-RELATED	
Advertising	730300
Aircraft Manufacturing	600100
Aircraft Sales (retail)	690200
Airport Parking	750000
Airport Security	650100
Airport Terminal Services	650500
Auto Rental	750001
Auxiliary Aircraft Parts Manufacturing	600400
Aviation School	770402
Avionics Manufacturing	620100
Avionics Repair	730300
Barber Shops	720200
Book Stores	690200
Building Maintenance and Cleaning	730100
Coin-Operated Amusement	760200
Drinking Places	740000
Drug Stores	690200
Engine and Propeller Manufacturing	610700
Fire Departments	790300
Flight Insurance	700500
Flying Clubs	770400
Flying Instruction	770403
Food Services	690100
Freight Forwarding	650701
Gift Shops	690200
Hotels/Motels	720100
News Dealers	690200
Personnel Supply Services	730100
Police Department	790300
Repair Shops	730300
Restaurants	740000
Taxi Service	650100
Tobacco Shops	650100
Travel Agents	650702

1. Applying RIMS II Approach to Sales Data

I. Assumptions

A. Business - Fixed based operator (from survey)
B. RIMS II Code Number - 650500 (from Table F-1)
C. Sales - $100,000 (from survey)
D. RIMS II earnings multiplier for code number 650500 - 0.6131 (from RIMS II tables)

II. Earnings Impact Calculations

Sales times earnings multiplier
$100,000 x 0.6131 = $61,310

2. Applying RIMS II Approach to Payroll Data

I. Assumptions

A. Business - Engine and propeller manufacturer (from survey)
B. RIMS II Code Number - 610700 (from Table F-1)
C. Sales - None provided (from survey)
D. Payroll - $300,000 (from survey)
E. RIMS II earnings multiplier for code number 610700 - 0.7120 (from RIMS II tables)

II. Earnings Impact Calculations

A. Obtain direct coefficient household multiplier for applicabl RIMS code number (610700) - 0.3676 (from RIMS II tables).
B. Calculate economic base multiplier by dividing RIMS II earnings multiplier (0.7120) by direct coefficient household multiplier (0.3676) = 1.9369.
C. Determine earnings by multiplying payroll by economic base multiplier.

$300,000 x 1.9369 = $581,070

3. Applying RIMS II Approach to Employment Data

I. Assumptions

A. Business - Aerial sprayer (from survey)
B. RIMS II Code Number - 010100 (from Table F-1)
C. Sales - None provided (from survey)
D. Employees - 3 (estimated from airport manager)
E. RIMS II earnings multiplier for code number 010100 - 0.5662 (from RIMS II tables)

II. Earnings Impact Calculations

A. Obtain direct coefficient household multiplier for applicable RIMS code number (010100) - 0.2619 (from RIMS II tables).
B. Calculate economic base multiplier by dividing RIMS II earnings multiplier (0.5662) by direct coefficient household multiplier (0.2619) = 2.1619.
C. Obtain average earnings per job - $15,000 (from SIC number, RIMS II code number and county).
D. Determine payroll by multiplying the estimated number of employees (3) times the average earnings per job ($15,000) = $45,000.
E. Determine earnings by multiplying payroll by economic base multiplier

$45,000 x [illegible] = $[illegible].

REFERENCES

1. Air Transport Association of America, Aviation and the Community (Revised), Washington, DC, March, 1977.

2. Air Transport Association of America, The Economic Impact of Bradley International Airport at a Glance.

3. Air Transport Association of America, How to Do an Airport Economic Impact Study, Washington, DC, April, 1982.

4. Air Transport Association of America, Washington National, $661 Million Boost to Economy, April, 1980.

5. Applied Economics Associates, Inc., R. E. Hansen Research Associates, and William B. Beyers, The Economic Impact of the Anchorage International Airport, 1985.

6. Dick, G. W., "National Airport System Plan Entry Criteria for General Aviation Airports," Transportation Research Forum Proceedings, XX-1, pp. 481-87, Washington, DC, 1979.

7. Environmental Science and Engineering, Jacksonville International Airport Economic Impact Assessment, 1984.

8. Federal Aviation Administration, An Appreciation of the Social, Economic and Political Issues of General Aviation, prepared by Frank K. Smith, Washington, DC, June, 1977.

9. Federal Aviation Administration, General Aviation Pilot and Aircraft Activity Survey, Report No. FAA-MS-85-1, September, 1985.

10. Florida Department of Transportation, Albert Whitted Municipal Airport Economic Impact Assessment.

11. Gellman Research Associates, The Economic Impact of Baltimore-Washington International, Washington National, and Washington-Dulles International Airports, (to be published).

12. Genesee/Finger Lakes Regional Planning Council, A Study to Determine the Economic Impact of the Genesee County Airport Genesee County, New York, June, 1984.

13. Glickman, Norman J., Econometric Analysis of Regional Systems: Explorations in Model Building and Policy Analysis, New York, Academic Press, 1977.

14. Guam Airport Authority, Economic Impact! Your Airport and Your Community, 1977.

15. McLeod, Douglas S., (Florida Department of Transportation), Recommended Regional Economic Impact Procedures for Aviation Related Projects, (Draft Report), January, 1987.

16. McPheters, Lee R., The Economic Impact of the Phoenix Airport System, June, 1984.

17. National Airports Conference, Airport Economic Impact on the Communities, Group 6, October, 1978.

18. Pennsylvania Department of Transportation, Bureau of Aviation, The Economic Impact of Aviation in Pennsylvania, November, 1983.

19. Roanoke Office of Economic Development, Roanoke Regional Airport Economic Impact Analysis, 1986.

20. Transportation Research Board, Economic Benefits and Financing of General Aviation Airports, Circular Number 259, Washington, DC, July, 1983.

21. Tucson Airport Authority, Tucson International Airport, A Billion Dollar Asset to the City of Tucson.

22. University of Rhode Island, Theodore F. Green State Airport Master Plan, May, 1982.

23. U.S. Department of Commerce, Regional Input-Output Modeling System, April, 1981.

24. U.S. Department of Commerce/U.S. Department of Transportation, 1980 Survey of Airport Services, November, 1980.

END

2-87

DTIC